SCOPE & DEFINITIONS

This Chapter contains standards for air emissions sources.

Coal Refuse – Waste products of coal mining, cleanings and coal preparation operations (e.g., culm, gob, etc.) containing coal, matrix material, clay, and other organic and inorganic material.

Cold Cleaning Machine – Any device or piece of equipment that contains and/or uses liquid solvent, into which parts are placed to remove soils and other contaminants from the surfaces of the parts or to dry the parts. Cleaning machines that contain and use heated, nonboiling solvent to clean the parts are classified as cold cleaning machines.

Engler Decree – Unit of viscosity, symbolized as °E.

Fossil Fuel – Natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such material for the purpose of creating useful heat.

Freeboard Ratio – The ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.

Household Boilers – Any boiler with a nominal capacity lower than 37 kW (approximately 126,000 Btu/hr), designed to heat living areas and provided with an open expansion tank distributing hot water through gravity circulation.

Hydrochlorofluorocarbons (HCFCs) – Compounds comprised of hydrogen, chlorine, fluorine, and carbon atoms. These compounds have many of the useful properties of chlorofluorocarbons (CFCs), but are destroyed naturally in the lower atmosphere and do not persist to the same extent as CFCs. Only a fraction of HCFCs emitted can be transported to the ozone layer in the atmosphere where the chlorine could deplete ozone.

Incinerator – Any furnace used in the process of burning solid or liquid waste for the purpose of reducing the volume of the waste by removing combustible matter, including equipment with heat recovery systems for either hot water or steam generation.

Industrial Cycle Unit – A unit that produces energy (either electric or thermal) for industrial production. For the purposes of this Chapter, this definition includes any unit that is not covered by the definition of Thermal Heating Unit.

Motor Vehicle – Any commercially-available vehicle that is not adapted to military use which is self-propelled and designed for transporting persons or property on a street or highway, including (but not limited to) passenger cars, light duty vehicles, and heavy duty vehicles.

New Source – Any incinerator burning urban waste, special non-dangerous waste, and sanitory waste constructed on or after 13 February 1998. For other categories of sources, any facility/building, source, or project with a construction start date on (or after) 1 October 1994, or a pre-existing facility that has been substantially modified since 1 October 1994.

Ozone-Depleting Substances (ODS) – Substances having the potential to destroy ozone in the stratosphere. They include the following, and are specifically identified in Table 2.6.

- Chlorofluorocarbons (CFCs)
- Other fully halogenated chlorofluorocarbons
- Halons
- Carbon tetrachloride
- 1,1,1-Trichloroethane (methyl chloroform)
- Methyl bromide
- Hydrobromofluorocarbons
- Hydrochlorofluorocarbons (HCFCs)

Pathological Waste – Waste material consisting of only human or animal remains, anatomical parts, and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding (if applicable).

Process Heater – A device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.

Pyrolysis – The endothermic gasification of hospital waste and/or medical/infectious waste using external energy.

Steam Generating Unit – A device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This definition does not include nuclear steam generators or process heaters.

Substantially-Modified – Any modification to a facility/building the cost of which exceeds $1 million, regardless of funding source.

Thermal Heating Unit – A unit that produces heat or hot water for heating rooms, heating water for non-industrial uses, medical disinfection/sterilization, laundries, and kitchens/canteens/bakeries, and air conditioning plants.

Vapor Cleaning Machine – A batch or in-line solvent cleaning machine that boils liquid solvent generating solvent vapor that is used as a part of the cleaning or drying cycle.

Wood Residue – Bark, sawdust, slabs, chips, shavings, mill trim, and other wood products derived from wood processing and forest management operations.

CRITERIA

C2.1 INDUSTRIAL CYCLE & STEAM GENERATING/THERMAL HEATING UNITS

DoD installations operating thermal units (industrial cycle units, steam generating units, and thermal heating units) with a thermal capacity greater than 230 kW (approximately 785,000 Btu/hr) will provide the Italian Base Commander with sufficient information to seek the authorization of their units (see Chapter 1 for the process). The Italian Base Commander may submit the information to the Competent Regional Authority. The following requirements apply unless more protective requirements are established in the site-specific authorization.

C2.1.1 Air Emission Standards. The following criteria apply to industrial cycle units with a maximum design heat input capacity greater or equal to 2,930 kW (10 million Btu/hr) and to steam generating and thermal heating units greater than 35 kW (119,000 Btu/hr), as indicated below.

C2.1.1.1 Industrial cycle units (other than units combusting liquid or solid fossil fuels; see C2.1.1.2) and associated emissions controls, if applicable, must be designed to meet the emission standards for specific sized units shown in Table 2.1 at all times, except during periods of start-up, shut-down, soot blowing, malfunction, or when emergency conditions exist.

C2.1.1.2 For industrial cycle units combusting liquid or solid fossil fuels, fuel sulfur content cannot exceed 0.2% (weight percent). Sulfur dioxide emissions should comply with the values in Table 2.1.

C2.1.1.3 Steam generating, electric utility, or thermal heating units rated greater than 35 kW (approximately 119,000 Btu) heat input shall meet the following standards:

- Carbon dioxide emissions must be between 10–13 % when using liquid fuels and greater than 10% when using solid fuels.
- Sulfur compounds (expressed as sulfur dioxide, measured at the base of the stack) must be less than 0.2% by volume when using liquid fuels with a viscosity of more than 5°E and sulfur content less than 4% by weight.
- Flame conditions: the flame will be stable and not impinge on furnace walls or burner parts
- The temperature at the outlet must be greater than 90°C
- The composition of fuels permitted for use in combustion is given in Table 2.2 (solid fuels) and Table 2.3 (liquid fuels)

C2.1.2 Air Emissions Monitoring Requirements. All units with a thermal capacity greater than 2.2 MW (approximately 7.6 million Btu/hr) must have a properly calibrated and maintained continuous emissions monitoring system (CEMS) to measure carbon dioxide, carbon monoxide, and hydrogen. Units with a thermal capacity greater than 5 MW (approximately 17.1 million Btu/hr) must have a CEMS to measure the flue gas parameters in Table 2.1 as follows, unless a more protective monitoring regime is specified in the unit's authorization:

- For units with a maximum design heat input capacity greater than 8.8 MW (approximately 30 million Btu/hr): Opacity, except that CEMS is not required where gaseous or distillate fuels are the only fuels combusted
- For fossil-fuel fired units with a maximum design heat input capacity greater than 29.3 MW (100 million Btu/hr): Nitrogen oxides (NO_X) and either oxygen (O_2) or carbon dioxide (CO_2)

C2.2 INCINERATORS

DoD installations that operate on-site incinerators will provide the Italian Base Commander with sufficient information to seek the authorization of their incinerator (see Chapter 1 for the process). The Italian Base Commander may submit the information to the Competent Regional Authority. The following requirements apply to incinerators that do not combust dangerous waste or munitions (refer to Chapter 6 for information regarding dangerous waste disposal) unless more protective requirements are established in the site-specific authorization.

C2.2.1 Incinerators (Non-Sanitary Waste). Existing incinerators (constructed or authorized before 13 February 1998) must meet the emissions limits in Table 2.4. A written plan must be submitted to the Italian Base Commander (see Chapter 1 for the process) to modify the existing incinerator to meet the emissions limits for new incinerators (Table 2.5). The Italian Base Commander may submit this plan to the competent Regional Authority. This plan was due on 13 February 1999.

Previously authorized plants constructed before 1 January 1985 that have never been modified and that could not meet the emissions limits in Table 2.4 were required to close by 31 December 1999.

Incinerators constructed, substantially modified, or authorized after 13 February 1998 must be designed to meet the emission limits in Table 2.5.

C2.2.2 Sewage Sludge Incinerators. All sewage sludge incinerators must also be designed to meet the emission limits in Table 2.5 and an opacity limit of 20% at all times, except during malfunction or breakdown.

C2.2.3 Sanitary Waste Incinerators. The following standards apply to new and existing incinerators for sanitary waste (as defined in Chapter 6, Waste Management). These requirements do not apply to any portable units (field deployable), pyrolysis units, or units that burn only pathological, low-level radioactive waste, or chemotherapeutic waste. Refer to Chapter 6 for other requirements pertaining to sanitary waste management.

All new and existing Sanitary Waste Incinerators must be designed and operated according to the following conditions:

- The incineration unit must be designed, equipped, and operated in such a way that the gas resulting from the combustion of the waste is raised (even if under the most unfavorable conditions) at a temperature of at least 850°C after the last injection of combustion air, for at least 2 seconds and in presence of at least 6% oxygen.
- If the combustion chamber is fed with liquid waste or with a pulverized mixture of gaseous and solid substances derived from thermal pre-treatment and when the produced gas provides more than 50% of total generated heat, the oxygen content must be at least 3%.
- Incineration plants shall be equipped with auxiliary burners, which must be automatically activated when the temperature of the combustion gases falls below 850 °C or during start-up and shut-down operations as long as the waste is in the combustion chamber.

C2.3 PERCHLOROETHYLENE (PCE) & PETROLEUM DISTILLATE DRY CLEANING MACHINES

DoD installations that conduct on-site dry cleaning activities will provide the Italian Base Commander with sufficient information to seek authorization of their activity (see Chapter 1 for the process). The Italian Base Commander may provide the information to the Competent Regional Authority.

The following requirements apply to new and existing dry cleaning machines, unless more protective criteria are established in the unit's authorization. These requirements do not apply to coin-operated machines.

C2.3.1 Emissions from existing PCE and petroleum distillate dry cleaning machines, at installations that use more than 2,000 gallons/year of PCE (installation wide) in their dry cleaning operations, must be controlled with a refrigerated condenser, unless a carbon absorber is already installed. The temperature of the refrigerated condenser must be maintained at 45°F or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

C2.3.2 All new PCE and petroleum distillate dry cleaning systems must be of the dry-to-dry design with emissions controlled by a refrigerated condenser. The temperature of the

refrigerated condenser must be maintained at 45°F or less. Dry cleaning machines and control devices must be operated according to manufacturer recommendations.

C2.3.3 The PCE and petroleum distillate emission limit is 20 mg/m^3 if the mass outflow is greater than or equal to 0.1 kg/hr.

C2.4 CHROMIUM ELECTROPLATING & CHROMIUM ANODIZING TANKS

DoD installations that conduct on-site anodizing activities will provide the Italian Base Commander with sufficient information to seek authorization of their activity (see Chapter 1 for the process). The Italian Base Commander may provide the information to the Competent Regional Authority.

The following standards apply to new and existing tanks, unless more protective criteria are established in the unit's authorization. Existing sources must comply within 3 years of the publication date of this document, unless a shorter compliance schedule is established in the unit's authorization.

C2.4.1 Ventilation exhaust from new and existing tanks must be controlled by a wet scrubber, composite mesh-pad eliminator, fiber bed filter, or equivalent control device capable of limiting emissions to 0.015 milligrams per dry standard cubic meter (mg/dscm). Control devices must be operated according to manufacturer recommendations.

C2.4.2 Alternatively, in lieu of control devices, decorative chromium and chromium anodize tanks may use chemical tank additives to prevent the surface tension from exceeding 45 dynes per centimeter provided that the surface tension is monitored prior to the first initiation of electric current on a given day and every 4 hours thereafter.

C2.5 PETROLEUM DISTILLATE & HALOGENATED SOLVENT CLEANING MACHINES

These requirements apply to new and existing cleaning machines that use petroleum distillates or that use solvent which contains more than 5 percent by weight: methylene chloride (CAS No. 75-09-2), perchloroethylene (CAS No. 127-18-4), trichloroethylene (CAS No. 79-01-6), 1,1,1-trichloroethane (CAS No. 71-55-6), carbon tetrachloride (CAS No. 56-23-5), chloroform (CAS No. 67-66-3), or any combination of these halogenated solvents. Existing sources must comply within 3 years of the publication date of this document. (Note: 1,1,1-trichloroethane is an ozone depleting substance and must be phased out of existence by 31 December 2008.)

C2.5.1 All cold cleaning machines (remote reservoir and immersion tanks) must be covered when not in use. Additionally, immersion type cold cleaning machines must have either a 1-inch water layer or a freeboard ratio of at least 0.75.

C2.5.2 All vapor cleaning machines (vapor degreasers) must incorporate design and work practices which minimize the direct release of halogenated solvents or petroleum distillates to the atmosphere. The emission limit for perchloroethylene,

trichloroethylene, carbon tetrachloride, and petroleum distillates is 20 mg/m^3 if the mass outflow is greater than or equal to 0.1 kg/hr.

C2.6 OZONE DEPLETING SUBSTANCES (ODS)

C2.6.1 Except as allowed in C2.6.2, use (i.e., utilization in maintenance or servicing of products and equipment) of the following ODSs is prohibited. Running an existing system without maintenance (e.g., using a refrigerator) would not be classified as use.

- Chlorofluorocarbons (CFCs)
- Other fully halogenated chlorofluorocarbons
- Halons
- Carbon tetrachloride
- 1,1,1-Trichloroethane
- Hydrobromofluorocarbons

C2.6.2 Halons may still be used under the following conditions:

- Halons that have been recovered, recycled, or reclaimed may be used in existing fire protection systems and fire extinguishers until 31 December 2002.
- Fire protection systems and fire extinguishers containing halons may be operated without maintenance or servicing of the halons, but must be decommissioned and the halons recovered before 31 December 2003.
- Halons for critical uses as specified in Table 2.7.

C2.6.3 Except as allowed in C2.6.4, use (i.e., utilization in maintenance or servicing of products and equipment) of hydrochlorofluorocarbons (HCFCs) is prohibited in the following applications. Running an existing system without maintenance (e.g., using a refrigerator) would not be classified as use.

C2.6.3.1 In aerosols

C2.6.3.2 As solvents:

- In non-contained solvent uses (including open-top cleaners and open-top dewatering systems without refrigerated areas, in adhesives and mould-release agents when not employed in closed equipment, and for drain cleaning where HCFCs are not recovered)
- From 1 January 2002, in all solvent uses except precision cleaning of electrical and other components in aerospace and aeronautics applications, where use is prohibited beginning on 31 December 2008

C2.6.3.3 As refrigerants:

C2.6.3.3.1 In equipment produced after 31 December 1995 for the following uses:

- In non-confined direct-evaporation systems
- In household refrigerators and freezers
- In motor vehicle, tractor, and off-road vehicle or trailer air-conditioning systems operating on any energy source. However, for military applications, the use is prohibited on 31 December 2008
- In road public-transport air-conditioning

C2.6.3.3.2 In equipment produced after 31 December 1997 for use in rail transport air-conditioning

C2.6.3.3.3 In equipment produced after 31 December 1999 for the following uses:

- In public and distribution cold stores and warehouses
- For equipment of 150 kW and over, shaft input

C2.6.3.3.4 In all other refrigeration and air-conditioning equipment produced after 31 December 2000 with two exceptions:

- HCFCs can be used in fixed air-conditioning equipment with a cooling capacity of less than 100 kW until 1 July 2002
- HCFCs can be used in reversible air-conditioning/heat pumps until 1 January 2004

C2.6.3.3.5 The use of virgin HCFCs in the maintenance and servicing of refrigeration and air-conditioning equipment shall be prohibited on 1 January 2010. The use of all HCFCs in the maintenance and servicing of refrigeration and air-conditioning equipment shall be prohibited on 1 January 2015.

C2.6.3.4 For the production of foams except integral skin foams for use in safety applications and rigid insulating foams

C2.6.3.5 As carrier gas for sterilization substances in closed systems, in equipment produced after 31 December 1997

C2.6.3.6 In all other applications

C2.6.4 The use of HCFCs shall be permitted:

C2.6.4.1 In laboratory uses, including research and development

C2.6.4.2 As feedstock (i.e., undergoes chemical transformation in a process in which it is entirely converted from its original composition and whose emissions are insignificant)

C2.6.4.3 As halon substitutes in existing fire protection systems specified in Table 2-7 under the following conditions:

- Original halons contained in such fire protection systems shall be replaced completely
- Halons withdrawn shall be disposed in accordance with DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10.

C2.6.5 ODS Refrigerant Venting Prohibition. Do not intentionally release any class I or class II ODS refrigerant (identified in Table 2.6) in the course of maintaining, servicing, repairing, or disposing of appliances, industrial process refrigeration units, air conditioning units, or motor vehicle air conditioners. *De minimis* releases associated with good faith attempts to recycle or recover ODS refrigerants are not subject to this prohibition.

C2.6.6 ODS Fire Suppression Agent (Halon) Venting Prohibition. Do not intentionally release halons into the environment while testing, maintaining, servicing, repairing, or disposing of halon-containing equipment or using such equipment for technician training. Halon uses authorized in C2.6.2 are exempt from the venting prohibition in the following situations:

- *De minimis* releases associated with good faith attempts to recycle or recover halons (i.e., release of residual halon contained in fully discharged total flooding fire extinguishing systems)
- Emergency releases for the legitimate purpose of fire extinguishing, explosion inertion, or other emergency applications for which the equipment or systems were designed
- Releases during the testing of fire extinguishing systems if each of the following is true: systems or equipment employing suitable alternative fire extinguishing agents are not available; release of extinguishing agent is essential to demonstrate equipment functionality; failure of system or equipment would pose great risk to human safety or the environment; and, a simulant agent (i.e., substitute product that can perform the same function) cannot be used

C2.6.7 Recovery Requirements for ODSs. ODSs identified in Table 2.6 shall be recovered as follows using equipment operated by trained personnel:

- ODSs contained in commercial and industrial refrigeration/air-conditioning equipment, equipment containing solvents, fire protection systems, and fire extinguishers shall be recovered for disposition in accordance with DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10
- After 31 December 2001, ODSs contained in domestic refrigerators and freezers shall be recovered per DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10
- ODSs contained in products, installations, and equipment other than those mentioned above shall be recovered, if practicable, per DoD 4160.21-M, Defense Materiel Disposition Manual, Chapter 10

C2.6.8 Leakage of ODSs. The following precautionary measures must be taken to prevent leakage of ODSs in Table 2.6:

- All precautionary measures practicable shall be taken to prevent leakage of ODSs. In particular, fixed equipment with a refrigerating fluid charge of more than 3 kg shall be checked annually for leakages
- All precautionary measures practicable shall be taken to prevent and minimize leakage of methyl bromide from fumigation installations and operations in which methyl bromide are used
- All precautionary measures practicable shall be taken to prevent and minimize any leakage of ODSs inadvertently produced in the course of the manufacture of other chemicals

C2.7 MOTOR VEHICLES

These criteria apply to DoD-owned motor vehicles (as defined in the definitions section).

C2.7.1 Inspect all vehicles every 2 years to ensure that no one has tampered with the factory-installed emission control equipment. CO emissions for gasoline vehicles manufactured in Europe after 1986 will not exceed 3.5% in volume. For gasoline vehicles manufactured in Europe prior to 1986, the CO emission will not exceed 4.5% in volume. Motor vehicles manufactured in Europe and equipped with diesel engines will not exceed a 50% opacity (45% for buses).

C2.7.2 Use only unleaded gasoline (with a maximum lead content of 0.013 g/L) in vehicles that are designed for this fuel. The maximum lead content for lead-bearing gasoline is 0.15 g/L.

C2.8 VAPOR RECOVERY SYSTEMS AT GAS STATIONS

Gasoline distribution pumps at gas stations will be equipped with fuel vapor recovery systems. New construction must include the fuel vapor recovery system at the time of construction. Existing pumps must be upgraded with the fuel vapor recovery unit within 5 years from the publication date of this FGS.

A fuel vapor recovery system will be also installed at the inlet of the storage tank or at the tanker's outlet.

ADMINISTRATIVE ITEMS

1. The following activities must be authorized. Installations that operate such units or conduct such activities will provide the Italian Base Commander with sufficient information to seek the authorization (see Chapter 1 for the process). The Italian Base Commander may submit the information to the Competent Regional Authority.

- Industrial cycle and steam generating/thermal heating units with a thermal capacity greater than 230 kW (approximately 785,000 Btu/hr)
- Incinerators that burn non-dangerous waste and/or sanitary (medical) waste
- Incinerators that burn dangerous waste (including dangerous sanitary (medical) waste)
- Anodizing activities
- Dry cleaning activities

Table 2.1 Emission Standards for Industrial Cycle Units[1]

Plant Size	Fuel Type			
	Solid Fuel	Liquid Fuel	Gas Fuel	
			Methane	Coke Gas
Plants from 2.93 to 4.9 MW (10.0 to 17.2 million Btu/hr)				
PM (mg/m^3)	100-150	150	5	50
TOC (mg/m^3)	50	-	-	-
NO_x (mg/m^3)	650	500	350 (4)	350 (4)
SO_x (mg/m^3)	600/2000 (2)	1700 (3)	35 (5)	800/1700 (6)
Plants from 5 to 49 MW (17.1 – 167.2 million Btu/hr)				
PM (mg/m^3)	50	100	-	-
TOC (mg/m^3)	50	-	-	-
NO_x (mg/m^3)	650	500	350 (4)	350 (4)
SO_x (mg/m^3)	600/2000 (2)	1700 (3)	35 (5)	800/1700 (6)
Plants from 50 to 499 MW (170.6 – 1,703.1 million Btu/hr)				
CO (mg/m^3)	250	250	250	250
PM (mg/m^3)	50	50	50	50
TOC (mg/m^3)	-	-	-	-
NO_x (mg/m^3)	650	650	650	650
SO_x (mg/m^3)	1700	1700	1700	1700
Plants ^{3} 500 MW (≥1,706.5 million Btu/hr)				
CO (mg/m^3)	250	250	250	250
PM (mg/m^3)	50	50	50	50
TOC (mg/m^3)	-	-	-	-
NO_x (mg/m^3)	200	200	200	200
SO_x (mg/m^3)	400	400	400	800

Notes

1. These standards do not apply to household boilers. For other units, these standards do not apply during periods of startup, shutdown, malfunction, soot blowing, or when emergency conditions exist.
2. The SOx limit is 600 mg/m3 for fluidized bed plants and 2,000 mg/m3 for other plants.
3. The emission limit of 1700 mg/m3 is considered respected if the liquid fuel used has a sulfur content ≤ 1%.
4. If the gaseous fuel used contains nitrogen compounds, no emission limit is applied. However NOx emissions must be kept as low as possible.
5. The SOx limit of 35 mg/m3 is considered respected if methane or LPG fuel is used.
6. If coke fuel and blast furnace gas is used, the SOx emission limit is 800 mg/m3. If coke fuel is used, the SOx emission limit is 1700 mg/m3.
7. The units of mg/m3 are at normal physical conditions of 0ºC and 0.1013 Mpa.

Table 2.2 Solid Fuels

Quality	Volatile Substances[1, 3]	Ash % [1, 3]	Sulfur [1, 4]	Size [2] (mm)	Moisture Content[1, 5]
Metallurgical Coke	2	8 12	1	> 40 ≤ 40	8 12
Gas Coke	2	8 12	1	> 40 ≤ 40	10 14
Anthracite (blind coal)	13	10	2	all sizes	5
Steam Coal	23	12	1	all sizes	6
Steam Coal	35	12	1	all sizes	6
Pitchy Lignite	40	20	10	> 40 ≤ 40	5 10
Xiloide Lignite	50	25	3	> 40 ≤ 40	15 20
Peat Lignite	40	30	2	-	25
Peat	40	30	2	-	35
Briquette	13	10	2	-	5

Notes

1. The above data are expressed in % by weight and represent the maximum limits.
2. The size, expressed in mm, indicate the average dimensions.
3. The volatile substances and ashes % represent completely dried samples.
4. The sulfur % represents a sample dried to reach constant weight and with a moisture content of 5%.
5. The moisture % indicates the total water content of the fuel sample analyzed.

Table 2.3 Liquid Fuels

Characteristics	Limit	Unit	Gas Oil (Diesel Fuel)	Fuel Oil			
				Very Fluid	Fluid	Semi-Fluid	Heavy Oil
Opacity	Min.	mm	-	3	2	2	1
Viscosity at 50 °C	-	°E	-	< 3°	3° - 5°	5° - 7°	> 7 °
Water and Sediments	Max.	% by volume	0.05	0.5	1	1	2
Total Sulfur	Max.	% by weight	0.2	2.5	3	4	4
Ashes	Max.	% by weight	-	0.05	0.10	0.15	-
Distillation at 150 °C	Max.	% by volume	2	-	-	-	-
Distillation at 250 °C	-	% by volume	< 65	< 65	< 65	< 65	< 65
Distillation at 350 °C	-	% by volume	³ 85	< 85	< 85	< 85	< 85

Table 2.4 Emission Limits for Non-Sanitary Waste Incinerators Constructed/Authorized on or before 13 February 1998

Pollutant	Hourly Average Values (mg/m^3)	
Total particulates	100 (for plants with capacity < 3 t/hr)	30 (for plants with capacity ≥ 3 t/hr)
Organic compounds (as TOC)	20	
Cd + Tl + Hg	0.2 (as sum of concentrations)	
Sb + Pb + Cu + Mn + V + Sn + Cr	5 (as sum of concentrations)	
Cr + Co + Ni + As	1 (as sum of concentrations)	
PCDD + PCDF	0.004	
Hydrochloric acid (HCl)	100 (for plants with capacity < 3 t/hr)	50 (for plants with capacity ≥ 3 t/hr)
Hydrofluoric acid (HF)	4 (for plants with capacity < 3 t/hr)	2 (for plants with capacity ≥ 3 t/hr)
Sulfur dioxide (SO_2)	300	
NO_2 + SO_2	600	
CO	100	

Table 2.5 Emission Limits for Non-Sanitary Waste Incinerators Constructed/Authorized after 13 February 1998

Pollutant	Limit (mg/m^3)
Daily Average Values	
Particulates	10
Organic compounds (as TOC)	10
HCl	20
HF	1
SO_2	100
CO	50
NO_2	200
Hourly Average Values	
Particulates	30
Organic compounds (as TOC)	20
HCl	40
HF	4
SO_2	200
CO	100
NO_2	400
Average Values with Sample Period of 1 Hour	
Cd + Tl and their compounds, expressed as (Tl) and (Cd)	0.05
Hg and its compounds, expressed as (Hg)	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, Sn, V	0.5 average value of the pollutants concentrations sum
Average Values (Sum of Mass Concentrations of Dioxins and Dibenzofurans) with Sample Period of 8 Hours	
Polychlorobenzodioxins and polychlorodibenzofurans (PCDD + PCDF) [1]	0.1×10^{-6}
Average Values with Sample Period of 8 Hours	
Aromatic polycyclic hydrocarbons	0.01

Note

1. The average value is determined by adding the mass concentration values for all PCDD and PCDF (each multiplied by the corresponding toxic equivalent factor).

Table 2.6 Ozone Depleting Substances

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
Chlorofluorocarbons (CFCs)			
$CFCl_3$	CFC – 11	75-69-4	Trichlorofluoromethane
CF_2Cl_2	CFC – 12	75-71-8	Dichlorodifluoromethane
$C_2F_3Cl_3$	CFC – 113	76-13-1	Trichlorotrifluoroethane
$C_2F_4Cl_2$	CFC – 114	76-14-2	Dichlorotetrafluoroethane
C_2F_5Cl	CFC – 115	76-15-3	Chloropentafluoroethane
Other Fully Halogenated Chlorofluorocarbons			
CF_3Cl	CFC – 13	75-72-9	Chlorotrifluoromethane
C_2FCl_5	CFC – 111	354-56-3	Pentachlorofluoroethane
$C_2F_2Cl_4$	CFC – 112	76-12-0	Tetrachlorodifluoroethane
C_3FCl_7	CFC – 211	422-78-6	Heptachlorofluoropropane
$C_3F_2Cl_6$	CFC – 212	3182-26-1	Hexachlorodifluoropropane
$C_3F_3Cl_5$	CFC – 213	2354-06-5	Pentachlorotrifluoropropane
$C_3F_4Cl_4$	CFC – 214	29255-31-0	Tetrachlorotetrafluoropropane
$C_3F_5Cl_3$	CFC – 215	4259-43-2	Trichloropentafluoropropane
$C_3F_6Cl_2$	CFC – 216	661-97-2	Dichlorohexafluoropropane
C_3F_7Cl	CFC – 217	422-86-6	Chloroheptafluoropropane
$CF_2Cl_2 \bullet C_2F_2H_4$	CFC – 500	56275-41-3	Dichlorodifluoromethane • Difluoroethane
$CHF_2Cl \bullet C_2F_5Cl$	CFC – 502	74-45-6 and 76-15-3	Chlorodifluoromethane • Chloropentafluoroethane
$CF_3Cl \bullet CHF_3$	CFC – 503	75-72-9 and 75-46-7	Chlorotrifluoromethane • Trifluoromethane
Halons			
CF_2BrCl	Halon – 1211	353-59-3	Bromochlorodifluoromethane
CF_3Br	Halon – 1301	75-63-8	Bromotrifluoromethane
$C_2F_4Br_2$	Halon – 2402	124-73-2	Dibromotetrafluoroethane
Carbon Tetrachloride			
CCl_4	Carbon Tetrachloride	56-23-5	Carbon Tetrachloride
1,1,1-trichloroethane			
$C_2H_3Cl_3$	Methyl Chloroform	71-55-6	1,1,1-trichloroethane
Methyl Bromide			
CH_3Br	Methyl Bromide	74-83-9	Methyl Bromide
Hydrobromofluorocarbons			
$CHFBr_2$	N/A		Dibromofluoromethane
CHF_2Br	HBFC-22B1		Bromodifluoromethane
CH_2FBr	N/A		Bromofluoromethane
C_2HFBr_4	N/A		Tetrabromofluoroethane

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
$C_2HF_2Br_3$	N/A		Tribromodifluoroethane
$C_2HF_3Br_2$	N/A		Dibromotrifluoroethane
C_2HF_4Br	N/A		Bromotetrafluoroethane
$C_2H_2FBr_3$	N/A		Tribromofluoroethane
$C_2H_2F_2Br_2$	N/A		Dibromodifluoroethane
$C_2H_2F_3Br$	N/A		Bromotrifluoroethane
$C_2H_3FBr_2$	N/A		Dibromofluoroethane
$C_2H_3F_2Br$	N/A		Bromodifluoroethane
C_2H_4FBr	N/A		Bromofluoroethane
C_3HFBr_6	N/A		Hexabromofluoropropane
$C_3HF_2Br_5$	N/A		Pentabromodifluoropropane
$C_3HF_3Br_4$	N/A		Tetrabromotrifluoropropane
$C_3HF_4Br_3$	N/A		Tribromotetrafluoropropane
$C_3HF_5Br_2$	N/A		Dibromopentafluoropropane
C_3HF_6Br	N/A		Bromohexafluoropropane
$C_3H_2FBr_5$	N/A		Pentabromofluoropropane
$C_3H_2F_2Br_4$	N/A		Tetrabromodifluoropropane
$C_3H_2F_3Br_3$	N/A		Tribromotrifluoropropane
$C_3H_2F_4Br_2$	N/A		Dibromotetrafluoropropane
$C_3H_2F_5Br$	N/A		Bromopentafluoropropane
$C_3H_3FBr_4$	N/A		Tetrabromofluoropropane
$C_3H_3F_2Br_3$	N/A		Tribromodifluoropropane
$C_3H_3F_3Br_2$	N/A		Dibromotrifluoropropane
$C_3H_3F_4Br$	N/A		Bromotetrafluoropropane
$C_3H_4FBr_3$	N/A		Tribromofluoropropane
$C_3H_4F_2Br_2$	N/A		Dibromodifluoropropane
$C_3H_4F_3Br$	N/A		Bromotrifluoropropane
$C_3H_5FBr_2$	N/A		Dibromofluoropropane
$C_3H_5F_2Br$	N/A		Bromodifluoropropane
C_3H_6FBr	N/A		Bromofluoropropane
Hydrochlorofluorocarbons (HCFCs)			
$CHFCl_2$	HCFC – 21		Dichlorofluoromethane
CHF_2Cl	HCFC – 22		Chlorodifluoromethane
CH_2FCl	HCFC – 31		Chlorofluoromethane
C_2HFCl_4	HCFC – 121		Tetrachlorofluoroethane
$C_2HF_2Cl_3$	HCFC – 122		Trichlorodifluoroethane
$C_2HF_3Cl_2$	HCFC – 123		Dichlorotrifluoroethane
C_2HF_4Cl	HCFC – 124		Chlorotetrafluoroethane
$C_2H_2FCl_3$	HCFC – 131		Trichlorofluoroethane
$C_2H_2F_2Cl_2$	HCFC – 132		Dichlorodifluoroethane
$C_2H_2F_3Cl$	HCFC – 133		Chlorotrifluoroethane
$C_2H_3FCl_2$	HCFC – 141		Dichlorofluoroethane
CH_3CFCl_2	HCFC – 141b		1,1-dichloro-1-fluoroethane
$C_2H_3F_2Cl$	HCFC – 142		Chlorodifluoroethane
CH_3CF_2Cl	HCFC – 142b		1-chloro-1,1-difluoroethane
C_2H_4FCl	HCFC – 151		Chlorofluoroethane

Molecular Formula	Common Name	CAS Number[1]	Chemical Name
C_3HFCl_6	HCFC – 221		Hexachlorofluoropropane
$C_3HF_2Cl_5$	HCFC – 222		Pentachlorodifluoropropane
$C_3HF_3Cl_4$	HCFC – 223		Tetrachlorotrifluoropropane
$C_3HF_4Cl_3$	HCFC – 224		Trichlorotetrafluoropropane
$C_3HF_5Cl_2$	HCFC – 225		Dichloropentafluoropropane
$CF_3CF_2CHCl_2$	HCFC – 225ca		1,1-dichloro-2,2,3,3,3-pentafluoropropane
CF_2ClCF_2CHClF	HCFC – 225cb		1,3-dichloro-1,2,2,3,3-pentafluoropropane
C_3HF_6Cl	HCFC – 226		Chlorohexafluoropropane
$C_3H_2FCl_5$	HCFC – 231		Pentachlorofluoropropane
$C_3H_2F_2Cl_4$	HCFC – 232		Tetrachlorodifluoropropane
$C_3H_2F_3Cl_3$	HCFC – 233		Trichlorotrifluoropropane
$C_3H_2F_4Cl_2$	HCFC – 234		Dichlorotetrafluoropropane
$C_3H_2F_5Cl$	HCFC – 235		Chloropentafluoropropane
$C_3H_3FCl_4$	HCFC – 241		Tetrachlorofluoropropane
$C_3H_3F_2Cl_3$	HCFC – 242		Trichlorodifluoropropane
$C_3H_3F_3Cl_2$	HCFC – 243		Dichlorotrifluoropropane
$C_3H_3F_4Cl$	HCFC – 244		Chlorotetrafluoropropane
$C_3H_4FCl_3$	HCFC – 251		Trichlorofluoropropane
$C_3H_4F_2Cl_2$	HCFC – 252		Dichlorodifluoropropane
$C_3H_4F_3Cl$	HCFC – 253		Chlorotrifluoropropane
$C_3H_5FCl_2$	HCFC – 261		Dichlorofluoropropane
$C_3H_5F_2Cl$	HCFC – 262		Chlorodifluoropropane
C_3H_6FCl	HCFC – 271		Chlorofluoropropane

Note

1. The American Chemical Society's Chemical Abstracts Service number.

Table 2.7 Critical Uses of Halon

Use of Halon 1301: 1. In aircraft for the protection of crew compartments, engine nacelles, cargo bays, and dry bays 2. In military land vehicles and naval vessels for the protection of spaces occupied by personnel and engine compartments 3. For the making inert of occupied spaces where flammable liquid and/or gas release could occur in the military and oil, gas, and petrochemical sector, and in existing cargo ships 4. For the making inert of existing manned communication and command centers of the armed forces or others, essential for national security 5. For the making inert of spaces where there may be a risk of dispersion of radioactive matter 6. In the Channel Tunnel and associated installations and rolling stock
Use of Halon 1211: 1. In hand-held fire extinguishers and fixed extinguisher equipment for engines for use on board aircraft 2. In aircraft for the protection of crew compartments, engine nacelles, cargo bays, and dry bays 3. In fire extinguishers essential to personal safety used for initial extinguishing by fire brigades 4. In military and police fire extinguishers for use on persons